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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/575,246	12/11/2006	Ge Ming Lai	404339	6963
23548 7590 03/18/2010 LEYDIG VOIT & MAYER, LTD 700 THIRTEENTH ST. NW SUITE 300 WASHINGTON, DC 20005-3960				
EXAMINER WANG, CHANG YU				
ART UNIT		PAPER NUMBER		
16-49				
NOTIFICATION DATE		DELIVERY MODE		
03/18/2010		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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### Office Action Summary

**Application No.**

10/575,246

**Applicant(s)**

LUI, GE MING

**Examiner**

CHANG-YU WANG

**Art Unit**

1649

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 December 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 11-14, 17, 27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-14, 17, 27 and 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-06)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**  
**RESPONSE TO AMENDMENT**

***Status of Application/Amendments/claims***

1. Applicant's amendment filed 12/08/09 is acknowledged. Claims 1-10, 15-16 and 18-26 are cancelled. Claims 11 and 13-14 are amended. Claims 11-14, 17 and 27-28 are pending in this application and under examination in this office action.
2. Applicant's arguments filed on 12/08/09 have been fully considered but they are not deemed to be persuasive for the reasons set forth below.

***Claim Rejections/Objections Maintained***

In view of the amendment filed on 12/08/09, the following rejections are maintained.

***Claim Objections***

3. Claim 13 is objected to because of the following informalities: the original limitation (c) recited in the claim has been deleted so the limitations (d) and (e) should be the limitations (c) and (d). Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 11-14 and 17 stand rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5827641 (Parenteau et al. issued on Oct 27, 1998) in view of US Patent No. 6645715 (Griffith et al. issued on Nov 11, 2003, priority Jan 25, 1999) and US Patent No. 6689165 (Jacob et al., issued Feb 10, 2004, priority Mar 31, 2000). The rejection is maintained for the reasons made of record.

Claims 11-14 and 17 as amended are drawn to an artificial full thickness or a half full thickness cornea transplant support comprising a base biopolymer having the thickness of approximately an average cornea and having the shape of a cornea, with a convex and concave side and suitable for transplantation onto a damaged cornea; and the biopolymer having incorporated within it an attachment reagent consisting essentially of one or more the following: laminin, fibronectin, RGDS, bFGF conjugated with polycarboxophil, and EGF conjugated with polycarboxophil, wherein the biopolymer is molded into the shape of a cornea, with a convex and concave side, seeding or not seeding human corneal endothelial cells onto the convex side of the biopolymer, and suitable for implantation onto a damaged cornea. Independent claim 13 also

encompasses a confluent layer of human corneal endothelial cells on the convex side of the biopolymer.

On p. 6 of the response, Applicant argues that the claimed invention is a corneal transplant support not an artificial cornea as taught by Parenteau et al or Griffith et al.. Applicant argues that amended claims do not encompass a support having any cell types within the corneal support and do not contain stroma, epithelial cells or keratocytes. Applicant argues that the claimed corneal support has either an average of the thickness (0.530mm) or half of the average thickness (0.265mm thick) as shown in the attachment A (Doughty M. J.). On p. 7-9 of the response, Applicant argues that the construction of the corneal equivalent in Parenteau is nothing like the claimed invention. Applicant argues that the collagen biopolymer layer taught in Parenteau is approximately 0.5cm thick (i.e. 5000um thick), which is 10 times of the thickness of the average full-thickness cornea. Applicant argues that Griffith teaches an in-vitro, avascular, human corneal equivalent comprising immortalized human cell lines not a corneal biopolymer support. Applicant further cites *Graham v. John Deere Co.*, *KSR International Co. v. Teleflex Inc.*, *Ex parte Whalen II*, *In re Keller* in support of the arguments. Applicant's arguments have been fully considered but they are not persuasive.

In response, as previously made of record, Applicant cannot show nonobviousness by attacking references individually where the rejections are based on

combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

First, in contrast to Applicant's arguments that the claimed support does not encompass any cell types within the support, the claimed corneal transplant support recited in claim 13 still encompasses a layer of human corneal endothelial cells.

In addition, regardless of whether the claimed corneal transplant support contains endothelial cells, stroma, epithelial cells or keratocytes as in Parenteau, Griffith or Jacob, the limitation of "an artificial full-thickness or half-thickness corneal transplant support comprising" also reads on "comprising other cells as in Parenteau, Griffith or Jacob's artificial corneal transplant.

Further, the recitation of "an attachment reagent consisting essentially of one or more...." in amended claims is interpreted as "an attachment reagent comprising one or more...." because the claims have no clear indication what the basic and novel characteristics actually are.

"A consisting essentially of" claim occupies a middle ground between closed claims that are written in a consisting of format and fully open claims that are drafted in a comprising format." *PPG Industries v. Guardian Industries*, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir.1998). See also *Atlas Powder v. E.I. duPont de Nemours & Co.*, 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984); *In re Janakirama-Rao*, 317 F.2d 951, 137 USPQ 893 (CCPA 1963); *Water Technologies Corp. vs. Calco, Ltd.*, 850 F.2d 660, 7 USPQ2d 1097 (Fed. Cir. 1988). For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., *PPG*, 156 F.3d at 1355, 48 USPQ2d at 1355. See MPEP § 2111.03 [R-3].

In addition, in response to Applicant's argument that the thickness of Parenteau's corneal equivalent is 10 times thicker than the average full thickness cornea, the examiner asserts that Applicant's interpretation is incorrect. Based on Parenteau's

teaching, the Parenteau's corneal equivalent or organotypic corneal construct comprising an endothelium, stroma and epithelium can be used for ocular wound closure and full-thickness repair of the cornea (see col. 10, lines 10-24, in particular). Thus, the thickness of the Parenteau's corneal equivalent is either equal to the average full thickness or less than the average full thickness as recited in instant claims 11 and 13 because Parenteau's cornea equivalent encompasses the structures and cell layers of the real cornea and is used for transplantation (see col. 10, lines 1-25, in particular).

On p. 9 of the response, Applicant argues that Jacob teaches away from the claimed invention because Jacob teaches growth factors must be tethered or otherwise covalently bound to the polymer via a linear polyethylene oxide (PEO) molecule or amino acid or peptide with a molecular weight between 2000-8000. On 7-13 of the response, Applicant argues that none of the cited references teach a corneal transplant support comprising a biopolymer having the shape and the thickness of a cornea, which has incorporated into it an attachment reagent consisting essentially of one or more of the following compound: laminin, fibronectin, RGDS (SEQ ID NO:1), bFGF conjugated with polycarbophil, and EGF conjugated with polycarbophil, which is suitable for endothelial cell growth. Applicant argues that the applied references do not make the claimed invention prima facie obvious and teach away from the invention because the combined references do not teach each element of the claimed invention and the primary reference Parenteau and Griffith are directed to immortalized human corneal endothelial cells in a biopolymer shaped as a cornea and Jacob teaches away from the

claimed invention because Jacob teaches that the growth factors must be covalently bound or tethered to the biopolymer and teaches a different cell type. Applicant further cites *Graham v. John Deere Co.*, *KSR International Co. v. Teleflex Inc.*, *Ex parte Whalen II*, *In re Keller* in support of the arguments. Applicant's arguments have been fully considered but they are not persuasive.

In contrast to Applicant's arguments, the examiner asserts that Jacob and the applied references do not teach away from the claimed invention. The examiner asserts that the applied references do teach each element recited in the claims and thus render the claimed invention obvious. Briefly, Parenteau teaches an artificial cornea transplant support and a cornea equivalent comprising endothelial cells seeded on membranes made of biopolymer including collagen IV and coated with heparin and heparin-binding growth factor-1. Parenteau teaches the cornea equivalent (i.e. an artificial cornea transplant) comprising an inner endothelial cell layer, a middle stromal cell-collagen mixture layer and an external epithelial cell layer (see col. 14, claims 1-16; in particular) for cornea transplantation and also teaches the endothelial cells can be derived from different sources including different cornea endothelial cells and non-corneal endothelial cells derived from human (see col. 5, lines 1-5; col. 5, line 61-col. 6, line41; col. 8, lines 44-67, in particular). As previously made of record, since Parenteau's cornea equivalent encompasses the structures and cell layers of the real cornea and is used for transplantation, the thickness of the cornea equivalent is a full-thickness artificial cornea transplant as recited in instant claims 11 and 13 (see col. 10, lines 1-25, in particular) and the shape is also a desired shape of a cornea as recited in instant claim 11.

Parenteau teaches that the endothelial cells are seeded onto membranes of a cell culture insert consisting of polystyrene, polycarbonate, polypropylene or collagen (including types I, III-VII and XII), cellulose, glass fiber or other biocompatible polymer, which encompass collagen IV as recited in instant claim 12 and non-swelling biopolymer as recited in instant claim 17 (see col. 5, lines 21-60; col. 6, lines 50-65, in particular). Parenteau also teaches that the endothelial cells can be transformed and derived from different sources including human cornea endothelial cells (see col. 5, lines 1-5; col. 5, line 61-col. 6, line 41; col. 8, lines 44-67, in particular). Moreover, Parenteau teaches different thickness of the cornea equivalent for ocular wound healing, which is not full-thickness (see col. 10, lines 1-25, in particular).

Although Parenteau does not explicitly teaches the use of human corneal endothelial cells in the corneal transplant as in claims 13 and 14, Griffith teaches corneal endothelial cells in the corneal transplant can be derived from human (see col. 15-16). Although Parenteau does not teach a half full-thickness as recited in instant claims 14-16 and also does not teach laminin, RGDS, FGF or EGF-conjugated with polycarbophil as recited in instant claims 11, 13 and 14, Griffith teaches artificial cornea transplant supports or artificial cornea transplants with different thickness comprising a base biopolymer with laminin, fibronectin, RGDS, bFGF conjugated with polycarbophil, EGF conjugated with polycarbophil or heparin sulfate seeding human corneal endothelial cells onto the biopolymer as recited in instant claims 11-17 (see col. 19-24). Griffith teaches an artificial mammalian cornea comprising an endothelium, a stromal matrix, an epithelium and at least one layer of Bowman's or Descemet's membrane

(see col. 19-24; col. 12, lines 18-55; col. 19-22; col 26, claims 1-22). The teaching of Griffith is an artificial mammalian cornea so the shape is the shape of a cornea with a convex and a concave side. In addition, Jacob teaches that different adhesion attachments such as laminin, fibronectin, integrin, RGDS, FGF, EGF, and TGF- $\beta$ , can be used in a synthetic device for cornea augmentation or replacement to increase corneal epithelium cell adhesion (see abstract; col. 12-19; col. 19-20, claims 1-18, in particular). Griffith and Jacob teach an artificial mammalian cornea for corneal transplantation so the shape is the shape of a cornea with a convex and a concave side and thus the endothelial cells are on the convex side of the biopolymer.

It would have been obvious to a skilled artisan to use human corneal endothelial cells and different attachment agents in the artificial cornea transplant/transplant support disclosed by Parenteau to make a different thickness or a half full-thickness artificial cornea transplant because human corneal endothelial cells and different attachment agents have been successfully to be used for making a full or half-thickness artificial cornea transplant as taught by Griffith and Jacob. Note that

"The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945)". See MPEP § 2144.07.

In addition,

"It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their having been individually taught in the prior art." *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980); see also *In re Crockett*, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) and *Ex parte Quadranti*, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992). See MPEP § 2144.06.

Finally, in response to Applicant's argument that Jacob teaches away from the claimed invention because the growth factors must be tethered to the polymer, as previously, Applicant's arguments with regard to covalently bound or tethered to biopolymers are irrelevant because as long as the growth factor or attachment used in Jacob's artificial cornea is identical to the instant growth factor or attachment, the mechanisms of how the molecule is bound to the surface is intrinsic.

5. Claims 11-14, 17 and 27-28 stand rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5827641 (Parenteau et al. issued on Oct 27, 1998) in view of US Patent No. 6645715 (Griffith et al. issued on Nov 11, 2003, priority Jan 25, 1999) and US Patent No. 6689165 (issued Feb 10, 2004, priority Mar 31, 2000) as applied to claims 11-14, 17 above, and further in view of Thomson et al. (Biomaterials. 1991, 12: 37-40). The rejection is maintained for the reasons made of record. Applicant makes no remark on this rejection.

Although US Patent No. 5827641, US Patent No. 6645715 and US Patent No. 6689165 fail to teach the biopolymer is coated with diamond like carbon, Thomson teaches that diamond like carbon is inert and elicits no toxic or inflammatory response in cells, macrophages, and fibroblasts grown on its surface and thus biopolymers of an implant coated with diamond like carbon can improve the biocompatibility of the implant and thus the diamond like carbon coating is suitable for biomedical use (see p. 37 & abstract; p. 40, in particular).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teaching of Thomson to coat the biopolymer in the artificial corneal transplant support with diamond like carbon. The person of ordinary skill in the art would have been motivated to do so with an expectation of success because diamond like carbon coating is inert and can improve biocompatibility of the implant in biomedical use and thus to improve the artificial corneal transplant in the corneal transplantation.

### ***Conclusion***

6. NO CLAIM IS ALLOWED.

**7. THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

8. Any inquiry of a general nature or relating to the status of this general application should be directed to the Group receptionist whose telephone number is (571) 272-1600.

Papers relating to this application may be submitted to Technology Center 1600, Group 1649 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). Should applicant wish to FAX a response, the current FAX number for Group 1600 is (571) 273-8300.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chang-Yu Wang whose telephone number is (571) 272-4521. The examiner can normally be reached on Monday-Thursday from 8:30 AM to 6:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Stucker, can be reached at (571) 272-0911.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/CYW/  
Chang-Yu Wang, Ph.D.  
January 20, 2010

/Christine J Saoud/  
Primary Examiner, Art Unit 1647